Claims

What is claimed is:

1. Apparatus for word synchronization with large coding distance and fault tolerance for a partial-response maximum-likelihood (PRML) data channel in a direct access storage device (DASD) comprising:

a Viterbi detector for receiving equalized PR4 samples including a predefined word synchronization pattern; said Viterbi detector being optimized for said predefined word synchronization pattern; said Viterbi detector including

a two-state Viterbi trellis; and

a word synchronization detector for said two-state Viterbi trellis.

2. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said two-state Viterbi trellis and said word synchronization detector are operated on a 2T basis, where 1/T is the sample rate.

3. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said predefined word synchronization pattern includes multiple pattern match sequences.

4. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said predefined word synchronization pattern includes three pattern match sequences.

5. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said predefined word synchronization pattern includes a repetition code including pairs of zeros and pairs of ones.

6. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said predefined word synchronization pattern includes only even length magnets.

7. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said word synchronization detector implements a difference metric for said two-state Viterbi trellis and includes a three-way multiplexer.

8. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 7 wherein said three-way multiplexer includes an input of added incoming samples, said added incoming samples represented by $(Y_{K-2} + Y_{K-3})$.

9. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 8 wherein said three-way multiplexer includes an input of added and shifted incoming samples, said added and shifted incoming samples represented by $(Y_{K-2} + Y_{K-3}) + 4$.

10. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 9 wherein said three-way multiplexer includes an input of a difference metric, said difference metric represented by DS_{K-4}.

11. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 10 wherein said three-way multiplexer includes select inputs for selecting said added incoming samples $(Y_{K-2} + Y_{K-3})$ responsive to said added incoming samples $(Y_{K-2} + Y_{K-3})$ being greater than or equal to said difference metric DS_{K-4}.

12. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 10 wherein said three-way multiplexer includes select inputs for selecting said added and shifted incoming samples represented by $(Y_{K-2} + Y_{K-3}) + 4$ responsive to a shifted difference metric $DS_{K-4} - 4$ being greater than or equal to said added incoming samples $(Y_{K-2} + Y_{K-3})$.

13. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 10 wherein said three-way multiplexer includes select inputs for selecting said difference metric DS_{K-4} responsive to a shifted difference metric DS_{K-4} - 4 being less than said added incoming samples $(Y_{K-2} + Y_{K-3})$ and said added incoming samples $(Y_{K-2} + Y_{K-3})$ being less than said difference metric DS_{K-4}.

14. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 1 wherein said word synchronization detector implements a difference metric for said two-state Viterbi trellis and includes a path memory providing detected output decisions a_{K-13}, a_{K-12}.

15. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 14 wherein said detected output decisions a_{K-13}, a_{K-12} of said path memory are compared by a word sync pattern compare function with said predefined word synchronization pattern; said predefined word synchronization pattern including multiple pattern match sequences.

16. Apparatus for word synchronization with large coding distance and fault tolerance as recited in claim 16 wherein said word sync pattern compare function identifies at least a predefined subset of said multiple pattern match sequences and generates a start of data trigger for the partial-response maximum-likelihood (PRML) data channel.

17. A method for word synchronization with large coding distance and fault tolerance for a partial-response maximum-likelihood (PRML) data channel in a direct access storage device (DASD) comprising the steps of:

sensing a readback signal including a predefined word synchronization pattern; said predefined word synchronization pattern including multiple pattern match sequences;

providing a dedicated Viterbi detector optimized for said predefined word synchronization pattern and said Viterbi detector including a two-state Viterbi trellis and a word synchronization detector for said two-state Viterbi trellis;

applying equalized PR4 samples from said readback signal including said predefined word synchronization pattern to said dedicated Viterbi detector;

detecting a predefined number of said multiple pattern match sequences of said predefined word synchronization pattern with said Viterbi detector; and

generating a start of data trigger for the partial-response maximum-likelihood (PRML) data channel.

18. A method for word synchronization with large coding distance and fault tolerance for a partial-response maximum-likelihood (PRML) data channel as recited in claim 17 wherein the step of sensing a readback signal including said predefined word synchronization pattern includes the step of generating said predefined word synchronization pattern including only even length magnets.

19. A method for word synchronization with large coding distance and fault tolerance for a partial-response maximum-likelihood (PRML) data channel as recited in claim 17 wherein the step of providing a dedicated Viterbi detector optimized for said predefined word synchronization pattern includes the step of optimizing said Viterbi detector by eliminating branches from said two-state Viterbi trellis, thereby increasing coding distance.

20. A method for word synchronization with large coding distance and fault tolerance for a partial-response maximum-likelihood (PRML) data channel as recited in claim 17 wherein said predefined word synchronization pattern includes three pattern match sequences and where the step of detecting said predefined number of said multiple pattern match sequences of said predefined word synchronization pattern with said Viterbi detector includes the step of detecting two of said three pattern match sequences of said predefined word synchronization pattern.